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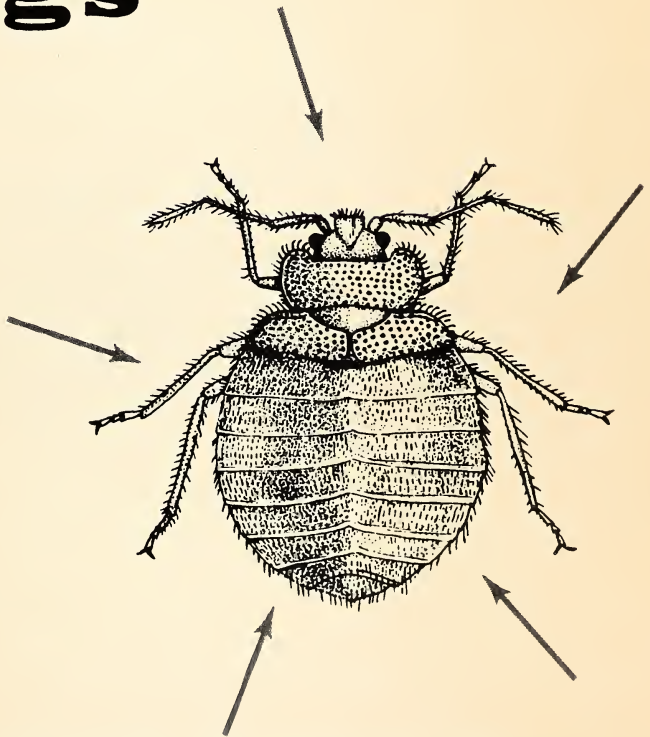
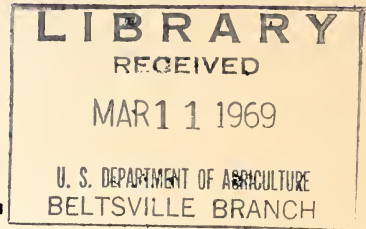
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LEAFLET NO. 453

how to control bed bugs



U.S. DEPARTMENT OF AGRICULTURE



how to control bed bugs

Bed bugs are sometimes called "red coats," "chinchies," or "mahogany flats."

In most parts of the United States there is only one species, known scientifically as *Cimex lectularius*. Another species, *Cimex hemipterus*, is common in Florida and perhaps in some of the other Southern States.

The bed bug feeds on blood—principally that of man. It feeds by piercing the skin with its elongated beak.

Bed bugs are spread chiefly by these means: Clothing and baggage of travelers and visitors; secondhand beds, bedding, and furniture; and laundry.

What they look like

The mature bed bug is a brown, wingless insect. Its size depends on the amount of food (blood) that the body contains. An unfed bed bug is between $\frac{1}{4}$ and $\frac{3}{8}$ inch long. The upper surface of the body has a flimsy, crinkly appearance.

When engorged with blood, the body becomes elongated and swollen and the color changes from brown to dull red. The change in size, shape, and color is so great that persons seeing a number of the bugs in different degrees of distention may believe that they are looking at different species.

Bed bug eggs are white and about $\frac{1}{32}$ inch long.

Newly hatched bugs are translucent

and nearly colorless. Young bugs are similar in shape to the adults. As they grow, they molt (shed their skins). After each molt they are pale at first, then become brownish.

To know that bed bugs are in a room, you do not always have to see them. There usually is an offensive odor in rooms where they are numerous. The odor comes from an oily liquid that they emit.

Feeding habits

Bed bugs feed mostly at night, by biting people who are asleep. But if they are very hungry and if the light is dim, they will feed during the day.

When bed bugs bite, they inject a fluid into the skin that assists them in obtaining blood. Often the fluid causes the skin to become irritated and inflamed; welts develop and there is much itching. It has never been proved that bed bugs are disease carriers in the United States.

If its feeding is undisturbed, a full-grown bed bug becomes engorged with blood in 3 to 5 minutes. It then crawls to its hiding place, where it remains for several days digesting its meal. When hunger returns, the bug emerges from hiding and seeks another meal of blood.

Bed bugs may be serious pests in animal and poultry houses and in laboratories where rabbits, rats, guinea pigs,

or birds are kept for experimental purposes. They also may feed on small animals and birds that are kept as pets. The loss of blood may weaken these animals.

How they develop

Under favorable conditions, one female bed bug lays about 200 eggs. When the insects feed regularly, eggs are laid at the rate of 3 or 4 a day. Maximum egg laying occurs when the temperature is above 70° F. No eggs are laid at temperatures lower than 50°.

When first laid, the eggs are coated with a sticky substance, which dries at once, causing the eggs to adhere to the object on which they were deposited. The unhatched eggs and the eggshells are seen, singly or in clusters, about the crevices in which the bugs hide.

At temperatures above 70° F. the eggs hatch in 6 to 17 days. At lower temperatures hatching may take as long as 28 days.

Newly hatched bugs feed at the first opportunity. They molt 5 times before reaching maturity. The bugs will feed a few days after each molt if a host is available. In 1 year there may be 3 or more generations.

There is considerable variation in the period of development, even among bugs hatching at the same time. As a result, bed bugs in all stages are present at all seasons of the year, except in unheated rooms in winter, when only adults may be present.

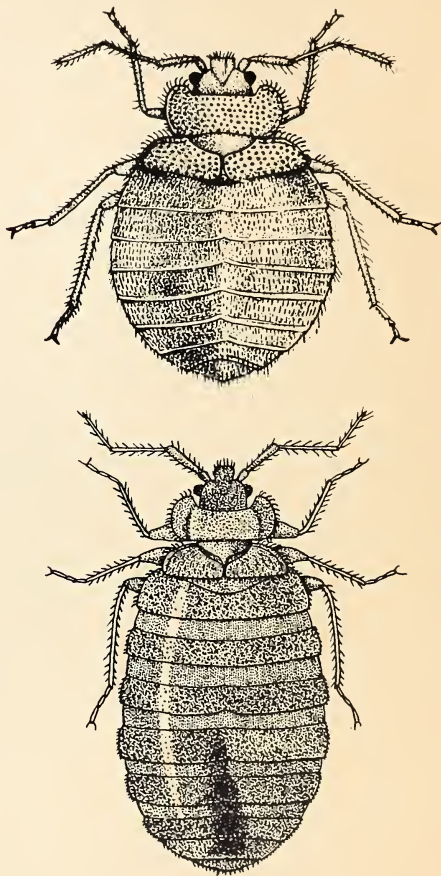
Length of life

Newly hatched bed bugs may live for several weeks without feeding during warm weather and for several months during cool weather. If they feed occasionally, they may live only about 10 months. However, it is common for older bed bugs to go 2 weeks to 2 months, or longer, without food. It is believed that under some conditions they can live a year or longer without food.

Where they hide

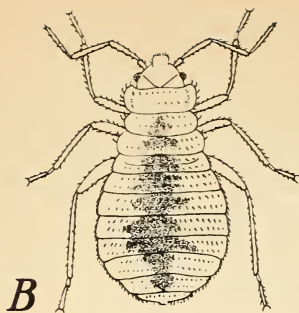
Habitual hiding places are usually made evident by black or brown spots of dried excrement on surfaces on which the bugs rest. Eggs, eggshells, and cast skins may also be seen near these places.

At the beginning of an infestation in a room, bed bugs are likely to be found only about the tufts, seams, and folds of mattresses and daybed covers; later they spread to crevices in the bedsteads.



M & A 11223

MATURE BED BUG. Above: Before engorgement. Below: After engorgement with blood (shows distention of body and altered appearance). Much enlarged.



M & A 11225

IMMATURE BED BUGS. *A*, Skin shed at first molt. *B*, Second stage (immediately after first molt). *C*, After first meal, distended with blood. Much enlarged.

If allowed to multiply, they establish themselves behind baseboards, window and door casings, pictures, and picture moldings, and in furniture, loosened wallpaper, cracks in plaster, and partitions.

Control in homes

To control bed bugs in homes, find the places where they hide in the daytime, and apply an insecticide directly into those places.

NOTE.—If you live in a private home in which the infestation is heavy, or in a hotel or apartment house, you may need the services of a pest-control operator. See page 6.

Kinds of Insecticide

DDT, lindane, malathion, ronnel, and pyrethrum are highly effective against bed bugs. They can be purchased at most drug, hardware, and department stores and at large food markets.

Most of these insecticides may be applied in sprays or dusts. Sprays are preferred. Dusts do not cling to mattresses, bedsteads, or vertical surfaces as well as sprays do and therefore do not give as long-lasting protection. Also, they are harder to apply properly and are unsightly in exposed places in homes.

Sprays . . . What To Buy

The recommended insecticides are available as emulsifiable liquids. Any of these liquids may be mixed with water to make an emulsion spray or with kerosene to make a kerosene-solution spray.

Oil solutions of some of the insecticides may be purchased ready for use as sprays. Such sprays generally are more convenient for home use.

If you wish to prepare a spray, mix one of the emulsifiable liquids with water or kerosene in the proportion necessary to give the desired percentage of insecticide in the finished spray. Labels on the containers usually state the percentage of insecticide desirable in the finished spray and give directions for mixing. The accompanying table is a further guide. (If an emulsifiable liquid of the strength specified in the table is not readily available, read the directions for mixing that appear on the labels of the products that are available and select a product whose label includes specific directions for bed bug control.)

Pyrethrum sprays should contain at least 0.2 percent of pyrethrins. Most pyrethrum preparations contain synergists—such as piperonyl butoxide, sulfoxide, and sesame oil—which increase the

Resistance to Insecticides

In many areas bed bugs have become resistant to DDT, and other insecticides must be applied.

In some of these areas lindane controls the DDT-resistant bugs, but in some localities the bugs have developed resistance to this insecticide also.

Malathion, ronnel, and pyrethrum are effective against bed bugs, and no resistance to them has been observed (July 1968).

effectiveness of the pyrethrum. The sprays should contain at least 1 percent of one of the synergists.

Pyrethrum usually kills bed bugs quicker than DDT, but it is not nearly as long lasting. Many household-type pyrethrum sprays contain 2 or 3 percent of DDT, which makes them longer lasting. Ready-to-use combination sprays of this type are widely available and are very effective against bed bugs and certain other household pests.

How To Use Sprays

A single treatment with a DDT, lindane, ronnel, or malathion spray, or with a pyrethrum-DDT spray, usually controls

bed bugs in a room and leaves a deposit that prevents reinfestation for several months. Since it is impossible to penetrate all the hiding places, control is not complete or immediate—a few living bugs may be seen for a week or 10 days after the treatment. If you continue to see bugs after 2 weeks, spray again.

You can control bed bugs with a spray containing only pyrethrum; but since such a spray does not leave a long-lasting deposit, several treatments 1 or 2 weeks apart are required.

Effectiveness of control depends on the thoroughness with which spray is applied. To treat a bed—

- Spray the slats, springs, and frame. Apply enough spray to wet them thoroughly. Do not miss any of the crevices where bugs hide.
- Apply a light mist spray to the entire mattress. Penetrate seams, tufts, and folds.

About 4 ounces of spray usually is required to treat a bed and mattress. Allow 1 to 2 hours for the bed to dry before putting on sheets or occupying it.

Spray upholstered furniture thoroughly.

In treating other hiding places, apply enough spray to penetrate all crevices and to wet all surfaces to the point of runoff. Spray walls to a height of several feet above the floor.

Guide for Mixing Sprays

Insecticides (as emulsifiable liquids) and certain of the strengths in which they may be purchased	Percentage of insecticide desired in spray	Amount of emulsifiable liquid to mix with 1 quart of water or kerosene
DDT, 25 percent	5.0	8 ounces
Lindane:		
20 percent	¹ 0.5	2 tablespoons
12 percent	0.1	1 teaspoon
12 percent	¹ 0.5	3 tablespoons
12 percent	0.1	2 teaspoons
Malathion, 50 percent	1.0	4 teaspoons
Pyrethrum, 1 percent ²	² 0.2	8 ounces
Ronnel:		
12 percent	1.0	6 tablespoons
24 percent	1.0	3 tablespoons

¹ For application to hiding places only. Apply lower concentrations on mattresses.

² Refers to pyrethrins content.

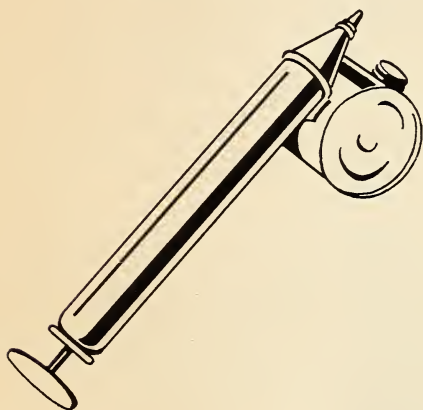
Kinds of Sprayers

Select a sprayer that can be adjusted to produce either coarse particles or a mist. The mist is needed when you spray mattresses and upholstered furniture; the coarse particles are needed for all other parts of the spraying job.

If only one or two rooms are to be treated, the job can be done with a 1- or 2-quart hand sprayer that delivers a

hold the nozzle within a few inches of the object or surface being sprayed; this is necessary because the sprayer operates under low pressure.

A 1- or 2-gallon garden-type compressed-air sprayer is recommended for treating several rooms or beds. The disk



Hand sprayer.

BN-69 62



Compressed-air sprayer.

BN-69 62

continuous spray. The sprayer should be equipped with a nozzle that can be adjusted to control the size of the spray particles. To insure proper coverage,

opening should be smaller than that normally used when spraying plants. Pressure should be light to moderate except when treating mattresses or upholstered furniture. High pressure causes the sprayer to produce fine particles or mist.

If You Need the Services of a Pest-Control Operator . . .

Bed bugs in hotels, apartments, and other multiple-type dwelling places may spread quickly from one unit to another. If they are found in one unit, the owner or manager of the building should have all the units inspected, and should arrange for control of any infestations revealed by the inspection.

As a rule, commercial pest-control operators are best qualified to inspect multiple-type dwelling places and to control infestations in them. Also, it is often advantageous to call in a pest-control operator to eliminate heavy general infestations in private homes.

After an infestation is under control, it may be advisable to have the pest-control operator check at regular intervals. In this way new infestations may be detected and eliminated before they spread.

Control in small-animal and poultry houses

In small-animal and poultry houses, good sanitation practices and proper construction reduce the number of places in which bed bugs can hide.

If an insecticide is needed, follow these recommendations:

- **SMALL-ANIMAL HOUSES.**—Apply any of the sprays referred to in the table on page 5, or apply a dust. A lindane or malathion spray should contain the higher of the two percentages of insecticide given in the table. A pyrethrum dust should contain 1 percent of pyrethrins or 0.2 percent of pyrethrins plus a synergist. Proper strengths of other dusts: DDT, 10 percent; lindane, 1 percent; malathion, 4 percent.

- **POULTRY HOUSES.**—Apply a 0.5-percent carbaryl spray, a 1-percent malathion spray, or a 0.2-percent pyrethrins spray. To prepare a pyrethrum or malathion spray, follow the guide at the bottom of page 5. To prepare a 0.5-percent carbaryl spray, mix 6½ ounces of 50-percent carbaryl wettable powder with 5 gallons of water.

A 4-percent malathion dust or 5-percent carbaryl dust may also be used.

Apply the spray or dust to all inside surfaces. Get it in all crevices. Spray should be coarse (see "Kinds of Sprayers," p. 6) and should be applied to the point of runoff.

Bed bugs often become established in laboratories where animals or birds are kept for experimental purposes. Where the nature of the experiments is such that insecticide contamination must be avoided, a pyrethrum spray or dust should be used, especially in treating cages. However, in most laboratories DDT, lindane, malathion, or ronnel can be applied to cracks, corners, and other hiding places without contaminating the caged animals.

PRECAUTIONS

Handle insecticides with care. Follow directions and heed all precautions on the container label.

Avoid unnecessary exposure to insecticides while applying them. Keep doors and windows open to avoid prolonged breathing of the spray mist and to reduce the fire hazard.

Do not apply oil sprays near an open flame or a pilot light.

Do not apply DDT, lindane, or ronnel in poultry houses, or carbaryl in homes.

Do not use carbaryl in poultry houses less than 7 days before slaughtering poultry.

Keep insecticides in closed, well-labeled containers in a dry place. Store them where they will not contaminate food or feed, and where children and animals cannot reach them. Promptly dispose of empty insecticide containers; do not use for any other purpose. When handling insecticide, wear clean, dry clothing.

Avoid repeated or prolonged contact of insecticide with your skin.

Avoid prolonged inhalation of insecticide dusts or mists.

Avoid spilling an insecticide on the skin and keep it out of the eyes, nose, and mouth. If you spill any on your skin or clothing, remove contaminated clothing immediately and wash the skin thoroughly with soap and water. Launder clothing before wearing it again. If the insecticide gets in the eyes, flush with plenty of water for 5 minutes and get medical attention.

After handling an insecticide, do not eat, drink, or smoke until you have washed your hands and face. Wash any exposed skin immediately after applying an insecticide.

Dispose of empty insecticide containers at a sanitary land-fill dump, or crush and bury them at least 18 inches deep in a level, isolated place where they will not contaminate water supplies. If you have trash-collection service, thoroughly wrap small containers in several layers of newspaper and place them in a trash can.

Other USDA Publications on Insects of the Home

Control of Nonsubterranean Termites.....	FB 2018
The House Fly: How To Control It	L 390
Silverfish and Firebrats: How To Control Them.....	L 412
Controlling Mosquitoes in Your Home and on Your Premises.....	HG 84
Controlling Household Pests.....	HG 96

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